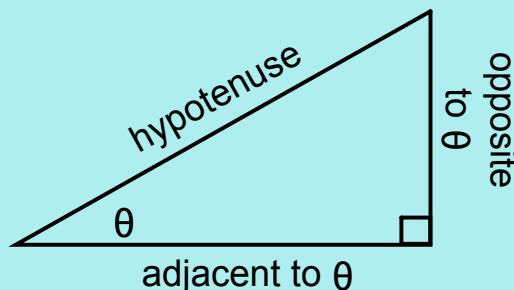


For any angle of interest, there are three (3) primary trigonometric ratios.

$$\text{sine of } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{cosine of } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{tangent of } \theta = \frac{\text{opposite}}{\text{adjacent}}$$



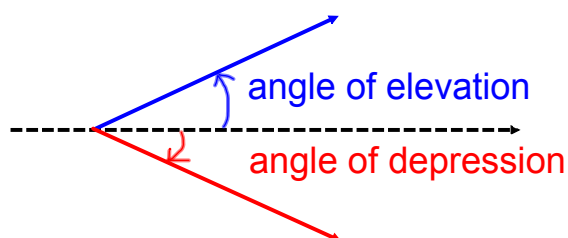
S o h C a h T o a

L5(7.6) - Solving Problems with Trigonometric Ratios

Terminology:

Angle of Elevation (or Inclination): the angle measured above the horizontal.

Angle of Depression (or Declination): the angle measured below the horizontal.



Steps:

- 1) Identify the unknown (what are you looking for?)
- 2) Label the sides of the triangle as opposite, hypotenuse, and adjacent with respect to the given angle (or the unknown if angle is what you are looking for)
- 3) Identify the trigonometric ratio that relates to the unknown and two of the unknowns OR Pythagorean Theorem OR the sum of the angles in a triangle.
- 4) Solve

Ex.1 A kite is 32 m above the ground. The string makes an angle of 39° with the ground. How long is the string?

$$\sin \theta = \frac{O}{H}$$

$$\sin 39^\circ = \frac{32}{x}$$

$$x = \frac{32}{\sin 39^\circ}$$

$$x \approx 51$$

\therefore the string is 51m long.

Ex.2 A lighthouse observation deck is about 20 m above sea level. A boat is viewed at an *angle of depression* of 6° . How far is the boat from the base of the lighthouse?

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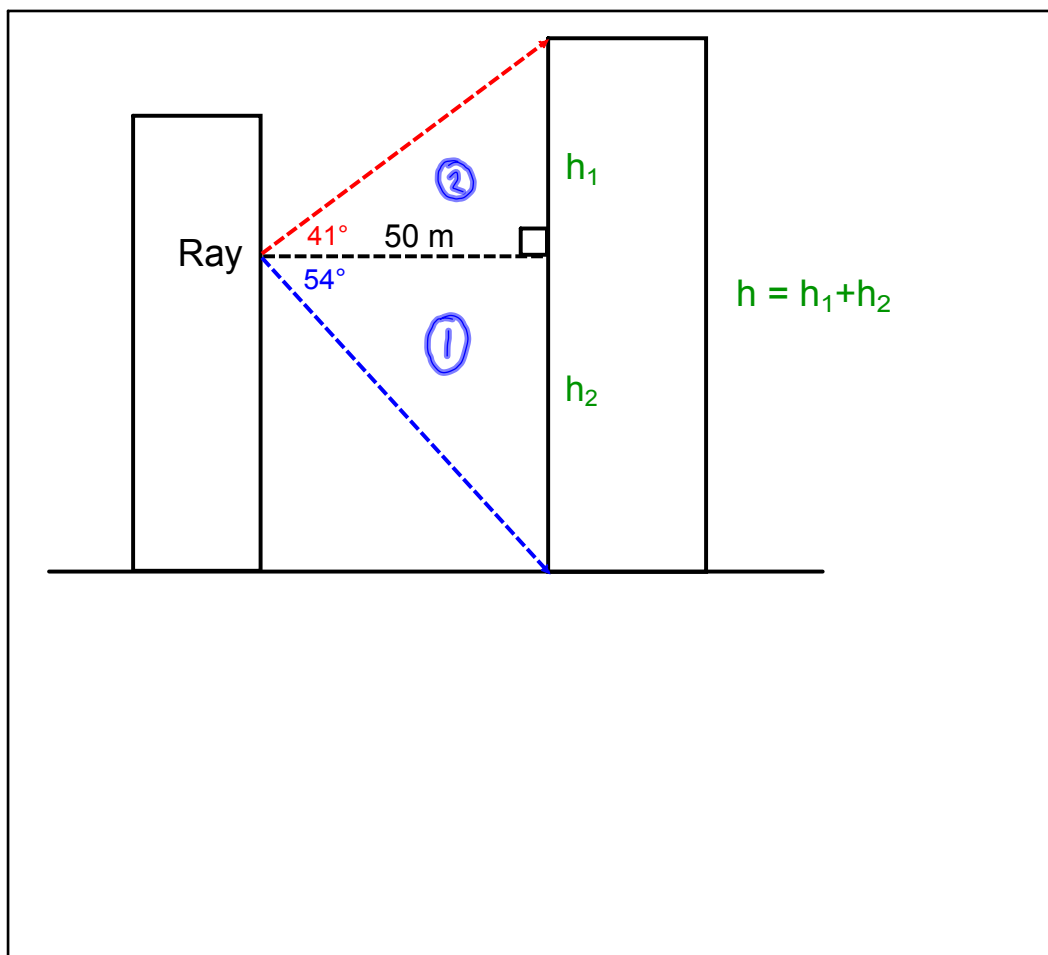


\therefore the boat is 190m away from the lighthouse

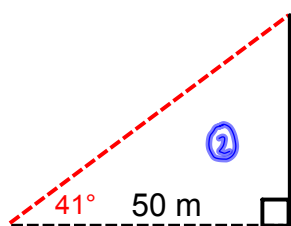
$$x = \frac{20}{\tan 6}$$

$$x \approx 190$$

Ex.3 From the window of a building, Ray finds the angle of elevation to the top of a second building to be 41° . The angle of depression to the bottom is 54° . The buildings are 50 m apart. How tall is the second building?



Solve one triangle for h_1 and the other triangle for h_2



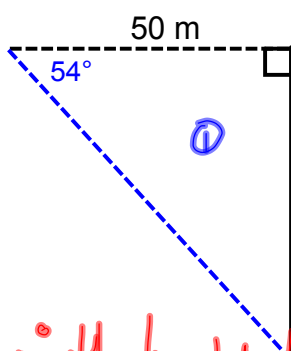
$\Delta 2$

$$\tan \theta = \frac{O}{A}$$

$$\tan 41^\circ = \frac{h_1}{50}$$

$$50 \tan 41^\circ = h_1$$

$$h_1 = 43.5$$



$\Delta 1$

$$\tan 54^\circ = \frac{h_2}{50}$$

$$h_2 = 50 \tan 54^\circ$$

$$h_2 = 68.8$$

$$\begin{aligned} \text{Total} &= h_1 + h_2 \\ &= 43.5 + 68.8 \\ &\approx 112 \end{aligned}$$

\therefore the height of the tall building is 112 m

Assigned Work:

p.412 # 2, 3, 7, 10